AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An X-ray exposure apparatus comprising:

two [[an]] X-ray mirrors containing a material having an absorption edge only in a range of a wavelength ~~region~~ other than 0.45 nm through 0.7 nm for ~~as to~~ X-rays, ~~to provide light at least having a component in wavelength ranging from 0.45 nm through 0.7 nm, and~~

~~the x-ray mirror emanates an X-ray having a peaked wavelength in a range from 0.45 nm to 0.7 nm, wherein~~

~~the material having an absorption edge only in a wavelength region other than 0.45 nm through 0.7 nm is disposed at an outermost surface of the X-ray mirror, and~~

said X-ray mirrors receiving an X-ray having an angle of oblique ~~angle of the X-ray with respect to the X-ray mirror is not~~ incidence of no more than 1.5° ~~thereby providing the light at least having a component in wavelength ranging from 0.45 nm through 0.7 nm~~, wherein

a first of said X-ray mirrors collects an X-ray outgoing from said X-ray mirrors, and

a second of said X-ray mirrors increases an area of a region illuminable by X-rays outgoing from said X-ray mirrors.

2. (Original) The X-ray exposure apparatus according to claim 1, wherein said X-rays are included in radiation outgoing from a synchrotron radiation source.

Claim 3 (Cancelled)

4. (Currently Amended) The X-ray exposure apparatus according to claim 1, wherein said X-ray ~~mirror contains~~ mirrors contain a single type of mirror material selected from a group consisting of beryllium, titanium, silver, ruthenium, rhodium and palladium, nitrides, carbides and borides of these, diamond, diamond-like carbon and boron nitride.

Claims 5-10 (Cancelled)

11. (Original) The X-ray exposure apparatus according to claim 1 further comprising an X-ray mask, wherein said X-ray mask includes a membrane and an X-ray absorber formed on said membrane, and

said membrane contains a single species selected from a group consisting of diamond, diamond-like carbon, boron nitride and beryllium.

12. (Original) The X-ray exposure apparatus according to claim 1 further comprising an X-ray mask, wherein said X-ray mask includes a membrane and an X-ray absorber formed on said membrane,

said membrane contains a material having an absorption edge only in at least either one of a wavelength region of less than 0.45 nm and a wavelength region exceeding 0.7 nm as to X-rays, and

said X-ray absorber contains a material having an absorption edge in a wavelength region of at least 0.6 nm and less than 0.85 nm.

Claims 13-23 (Cancelled)

24. (Currently Amended) An X-ray exposure method comprising:

an X-ray incidence step of making X-rays incident upon [[an]] two X-ray mirrors containing a material having an absorption edge only in a range of wavelength ~~region~~ other than 0.45 nm through 0.7 nm for ~~as to~~ X-rays, said X-ray mirrors receiving an X-ray having an angle of oblique incidence on more than 15°; and

an exposure step of performing exposure with X-rays outgoing from said X-ray mirrors ~~and at least having a component in wavelength ranging from 0.45 nm through 0.7 nm~~, wherein ~~and~~

~~the x-ray mirror emanates an X-ray having a peaked wavelength in a range from 0.45 nm to 0.7 nm by setting an oblique angle of the X-ray with respect to the X-ray mirror to be not more than 1.5°, wherein~~

~~the material having an absorption edge only in a wavelength region other than 0.45 nm through 0.7 nm is disposed at an outermost surface of the X-ray mirror~~

a first of said X-ray mirrors collects an X-ray outgoing from said X-ray mirrors, and

a second of said X-ray mirrors increases an area of a region illuminable by X-rays outgoing from said X-ray mirrors.

25. (Original) The X-ray exposure method according to claim 24, further comprising an X-ray outgoing step of making said X-rays outgo from a synchrotron radiation source.

Claim 26 (Cancelled)

27. (Currently Amended) The X-ray exposure method according to claim 24, wherein said X-ray ~~mirror contains~~ mirrors contain a single type of mirror material selected from a group consisting of beryllium, titanium, silver, ruthenium, rhodium and palladium, nitrides, carbides and borides of these, diamond, diamond-like carbon and boron nitride.

Claims 28-33 (Cancelled)

34. (Original) The X-ray exposure method according to claim 24 employing an X-ray mask, wherein said X-ray mask includes a membrane and an X-ray absorber formed on said membrane, and

said membrane contains a single species selected from a group consisting of diamond, diamond-like carbon, boron nitride and beryllium.

35. (Original) The X-ray exposure method according to claim 24 employing an X-ray mask, wherein said X-ray mask includes a membrane and an X-ray absorber formed on said membrane,

said membrane contains a material having an absorption edge only in at least either one of a wavelength region of less than 0.45 nm and a wavelength region exceeding 0.7 nm as to X-rays, and

said X-ray absorber contains a material having an absorption edge in a wavelength region of at least 0.6 nm and less than 0.85 nm.

Claims 36-38 (Cancelled)

39. (Original) A semiconductor device manufactured with the X-ray exposure method according to claim 24.

40. (Currently Amended) A synchrotron radiation apparatus comprising a synchrotron radiation source and [[an]] <u>two</u> X-ray ~~mirror group including a plurality of X-ray~~ mirrors upon which radiation outgoing from said synchrotron radiation source is incident, ~~wherein~~

said <u>two</u> X-ray mirrors contain<u>ing</u> a material having an absorption edge only in a <u>range of</u> wavelength ~~region~~ other than 0.45 nm through 0.7 nm <u>for</u> ~~as to~~ X-rays, <u>and receiving an X-ray having an angle of oblique incidence on more than 15°,</u>[[;]]

~~the outgoing direction of said radiation outgoing from said synchrotron radiation source and the outgoing direction of reflected light outgoing from said X-ray mirror group are substantially identical,~~

~~said X-ray mirror provides light at least having a component in wavelength ranging from 0.45nm through 0.7 nm, and~~

~~the X-ray mirror emanates an X-ray having a peaked wavelength in a range from 0.45 nm to 0.7 nm, wherein~~

~~the material having an absorption edge only in a wavelength region other than 0.45 nm through 0.7 nm is disposed at an outermost surface of the X-ray mirror, and~~

~~an oblique angle of the X-ray with respect to the X-ray mirror is not more than 1.5°~~ ~~thereby providing the light at least having a component in wavelength ranging from 0.45 nm through 0.7 nm~~

<u>a first of said X-ray mirrors collects an X-ray outgoing from said X-ray mirrors, and</u>

a second of said X-ray mirrors increases an area of a region illuminable by X-rays outgoing from said X-ray mirrors.

Claim 41 (Cancelled)

42. (Currently Amended) A synchrotron radiation method employing a synchrotron radiation apparatus ~~comprising~~ including a synchrotron radiation source and ~~an X-ray mirror group including a plurality of~~ two X-ray mirrors upon which radiation outgoing from said synchrotron radiation source is incident, said two X-ray mirrors containing a material having an absorption edge only in a range of a wavelength other than 0.45 nm through 0.7 nm for X-rays, the ~~synchrotron radiation~~ method comprising:

a radiation incidence step of making ~~radiation outgoing from the synchrotron radiation source~~ incident upon [[an]] said two X-ray mirrors an X-ray outgoing from the synchrotron radiation source and having an angle of oblique incidence of no more than 1.5°; ~~containing a material having an absorption edge only in a wavelength region other than 0.45 nm through 0.7 nm as to X-rays,~~ and

an exposure step of performing exposure with X-rays outgoing from said X-ray mirrors, wherein

~~a reflected light emitting step of emitting reflected light from said X-ray mirror group in a direction substantially identical to the outgoing direction of the radiation outgoing from said synchrotron radiation source, said reflected light at least having a component in wavelength ranging from 0.45 nm through 0.7 nm, and~~

~~the x-ray mirror emanates an X-ray having a peaked wavelength in a range from 0.45 nm to 0.7 nm by setting an oblique angle of the X-ray with respect to the X-ray mirror to be not more than 1.5°, wherein~~

~~the material having an absorption edge only in a wavelength region other than 0.45 nm through 0.7 nm is disposed at an outermost surface of the X-ray mirror~~

a first of said X-ray mirrors collects an X-ray outgoing from said X-ray mirrors, and

a second of said X-ray mirrors increases an area of a region illuminable by X-rays outgoing from said X-ray mirrors.

Claims 43-45 (Cancelled)

46. (Currently Amended) The X-ray exposure apparatus of claim 1, further comprising means altering a peak wavelength of said light emanating from said X ray ~~mirror~~ mirrors while maintaining a direction of said light emanating from said X ray ~~mirror~~ mirrors.

47. (Currently Amended) The X-ray exposure apparatus of claim 1, further comprising means altering a peak wavelength of said light emanating from said X-ray ~~mirror~~ mirrors while maintaining an optical axis of said light emanating from said X-ray ~~mirror~~ mirrors.

48. (Currently Amended) The X-ray exposure method of claim 24, further comprising the step of altering a peak wavelength of said X-ray emanating from said X-ray ~~mirror~~ mirrors while maintaining a direction of said X-ray emanating from said X-ray ~~mirror~~ mirrors.

49. (Currently Amended) The X-ray exposure method of claim 24, further comprising the step of altering a peak wavelength of said X-ray emanating from said X-ray ~~mirror~~ mirrors while maintaining an optical axis of said X-ray emanating from said X-ray ~~mirror~~ mirrors.

50. (New) An X-ray exposure apparatus, comprising:

a first stage X-ray mirror, and

a second stage X-ray mirror, wherein

α represents an angle of oblique incidence of an X-ray incident on said first stage X-ray mirror and said second stage X-ray mirror,

L represents a distance between said first and second stage X-ray mirrors, as seen along an x-axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror,

D represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said second stage X-ray mirror, and

said α and L are changed to satisfy a relationship $D = L \times \tan(2\alpha)$, whereby respective optical axes of X-rays have substantially identical directions, and

a spectral distribution of an X-ray outgoing from said second stage is changed.

51. (New) An X-ray exposure apparatus. comprising:

a first stage X-ray mirror,

a second stage X-ray mirror, and

a third stage X-ray mirror, wherein

α represents an angle of oblique incidence of an X-ray incident on said first stage X-ray mirror and said third stage X-ray mirror,

2α represents an angle of oblique incidence of an X-ray incident on said second stage X-ray mirror,

L represents a distance between said first and second stage X-ray mirrors and a distance between said second and third stage X-ray mirrors, as seen along an x-axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror,

D represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said second stage X-ray mirror, and

said α and L are changed to satisfy a relationship $D = L \times \tan(2\alpha)$, whereby respective optical axes of X-rays have substantially identical directions, and
a spectral distribution of an X-ray outgoing from said third stage is changed.

52. (New) An X-ray exposure apparatus, comprising:
a first stage X-ray mirror,
a second stage X-ray mirror,
a third stage X-ray mirror, and
a fourth stage X-ray mirror, wherein

α represents an angle of oblique incidence of an X-ray incident on each of said first, second, third and fourth stage X-ray mirrors,

L represents a distance between said first and second stage X-ray mirrors and a distance between said third and fourth stage X-ray mirrors, as seen along an x-axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror,

D represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said third and fourth stage X-ray mirrors, and

said α and L are changed to satisfy a relationship $D = L \times \tan(2\alpha)$, whereby respective optical axes of X-rays have substantially identical directions, and a spectral distribution of an X-ray outgoing from said fourth stage is changed.

53. (New) An X-ray exposure apparatus, comprising:

a first stage X-ray mirror,

a second stage X-ray mirror,

a third stage X-ray mirror, and

a fourth stage X-ray mirror, wherein

α represents an angle of oblique incidence of an X-ray incident on each of said first and fourth stage X-ray mirrors,

β represents and angle of oblique incidence of an X-ray incident on each of said second and third stage X-ray mirrors,

$L\alpha$ represents a distance between said first and second stage X-ray mirrors and a distance between said third and fourth stage X-ray mirrors, as seen along an x-axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror,

$L\beta$ represents a distance between said second and third stage X-ray mirrors, as seen along said x-axis,

D represents a distance between said second and third stage X-ray mirrors, as seen along a y-axis corresponding to a direction perpendicular to said x-axis, and

said α, β, $L\alpha$ and $L\beta$ are changed to satisfy a relationship $D = 2 \times L\alpha \times \tan(2\alpha) = L\beta \times \tan(\beta - \alpha)$, whereby

respective optical axes of X-rays have substantially identical directions, and

a spectral distribution of an X-ray outgoing from said fourth stage is changed.